

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Mathematics for Computer Science
MIT 6.042J/18.062J

Law of Total Probability



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totalprob.1

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability

Law for reasoning
about probability
by cases

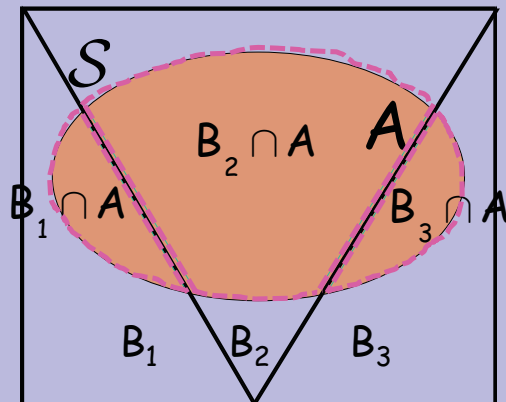


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totalprob.2

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability



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totalprob.3

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability

$$A = (B_1 \cap A) \cup (B_2 \cap A) \cup (B_3 \cap A)$$

$$\Pr[A] = \Pr[B_1 \cap A] + \Pr[B_2 \cap A] + \Pr[B_3 \cap A]$$



Albert R Meyer, May 3, 2013

totalprob.4

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability

$$A = (B_1 \cap A) \cup (B_2 \cap A) \cup (B_3 \cap A)$$

$$\Pr[A] = \Pr[A|B_1] \Pr[B_1] + \Pr[A|B_2] \Pr[B_2] + \Pr[A|B_3] \Pr[B_3]$$



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totalprob.5

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability

$$A = (B_1 \cap A) \cup (B_2 \cap A) \cup (B_3 \cap A)$$

$$\Pr[A] = \Pr[A|B_1] \Pr[B_1] + \Pr[A|B_2] \Pr[B_2] + \Pr[A|B_3] \Pr[B_3]$$



Albert R Meyer, May 3, 2013

totalprob.6

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Law of Total Probability

If S is disjoint union of B_0, B_1, \dots

$$\Pr[A] = \sum_i \Pr[A \cap B_i] = \sum_i \Pr[A|B_i] \cdot \Pr[B_i]$$



Albert R Meyer, May 3, 2013

totalprob.7

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